

A STUDY ON THE INFLUENCE OF COMMUNICATION INDUSTRY USING A NEW AVERAGE FUZZY RELATIONAL MAPS MODEL

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ABSTRACT

In this paper the influence of the Communication Industry over the public, children and young students in Tamil Nadu is analysed. This paper studies the advantages and disadvantages of the Communication Industry on the public using Fuzzy Relational Maps (FRMs). Here Fuzzy Relational Maps and the New Average Fuzzy Relational Maps are used for this study. The study is made using a survey. Further, it ends with a conclusion and suggestion.

AMS 2010 Subject Classification: 0352, 15B15

KEYWORDS: Fuzzy Logic, Fuzzy Matrices, Fuzzy Relational Maps (FRMs) Model, New Average Fuzzy Relational Maps (NAFRMs) Model, Hidden Pattern, Limit Point & Fixed Point

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INTRODUCTION

Fuzzy set theory was proposed by Professor L. A. Zadeh at the University of California at Berkeley in 1965 to quantitatively and effectively to handle the problems of this nature. Kosko B [1, 2] introduces some essential concepts, terminology, notations, and arithmetic of fuzzy sets and fuzzy logic. A new concept called Fuzzy Relational Maps (FRMs) was initiated by Vasantha et al. [3, 4 & 6] and T. Nagalakshmi et al. [9] studied the (FRMs). Very recently S. Udayakumar et al. [10] and R. Shanmugapriya et al. [8] have discussed the New Average Fuzzy Relational Maps (NAFRMs) model. A domain space and range space which are apparently different in terms of concepts are required to define FRMs. In general, every element of domain space need not be mapped to elements of range space. This model is best suited when the attributes related with the problem are divided into two separate sets, for example the relationship between a doctor and a patient or the relationship between an employee and employers and so on. This article we discuss the positive and negative impact of Communication Industry on the people, children, young students using the (NAFRMs) is analysed. This paper has four sections. In section one discussed introduction, section two description of the problem is given, section three studies the problem using NAFRMs and the final section uses the innovative technique of the comparison table to analyse the problem.

DESCRIPTION OF THE PROBLEM

For this study, a survey was conducted among a group of 100 people, divided into groups of 20 each. The data was collected from the various sections of the society like students, employee, home makers and old age people in and around Chennai with the help of a questionnaire. Due to difference in the opinions based on their age, taste, and various other situations, the domain space and the range space are disjoint. This article focuses on fuzzy relational maps. So, we are justified in using the Fuzzy Relational Maps (FRMs) model in analysing the problem.

Further the use of FRMs model is justified, as the data, only as unsupervised one. The attributes associated with the problem are described in the following. Consider the attributes of the Impact of Communication Industry on the Public.

Attributes Related to Communication Industry

C_1 : National and International news

C_2 : Educational Programmes

C_3 : Entertaining Programmes

C_4 : Sports Programmes

C_5 : Children's Programmes

C_6 : Jothidam

Attributes Related to the Public

P_1 : Gain Knowledge

P_2 : Relax

P_3 : Addicted to programme

P_4 : Students' studies get affected

P_5 : Waste of time

P_6 : Procuring lots of information

P_7 : Imprudent information

P_8 : Increase in crime rate

However, FRM model given by the five experts, who include Student, Industrial Person, Teacher and two public are presented in this section. Finally, the New Average Fuzzy Relational Maps model is used to give an equal importance to every expert and save time and economics.

THE IMPLEMENTATION OF THE NEW AVERAGE FUZZY RELATIONAL MAPS (NAFRMS) MODEL IS APPLIED TO THIS PROBLEM

The First Expert is a Public Person

The direct graph and connection matrix given by the first expert opinion.

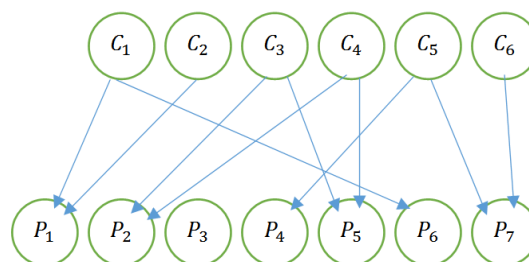


Figure 1

The relational connection matrix E_1

$$E_1 = \begin{bmatrix} 1 & 0 & 0 & 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 1 & 0 & 0 \\ 0 & 1 & 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & 0 & 1 & 0 \end{bmatrix}$$

Suppose the expert wishes to study the state vector $X_1 = (1 \ 0 \ 0 \ 0 \ 0 \ 0)$, that is the on state of the node ‘National and international news’ C_1 in the on-state and all other nodes in the off-state.

The effect of X_1 on the dynamical system is

$$X_1 E_1^T = (10000100) = X_2 \in R$$

$$X_2 E_1 = (110000) \in D$$

$$X_2 E_1^T = (10000100) = X_3 \in R$$

$$X_3 E_1 = (110000) \in D$$

$$X_3 E_1^T = (10000100) = X_4 = X_3 \in R$$

Thus the hidden pattern of the state vector X_1 is a fixed pair given by $\{(1 \ 0 \ 0 \ 0 \ 0 \ 1 \ 0 \ 0), (1 \ 1 \ 0 \ 0 \ 0 \ 0)\}$.

By keeping the node ‘National and international news’ in the on-state, the expert find that the public gain the knowledge as well as Procuring lots of information. It’s evident from the on-state of the nodes, P_1 and P_6 in the range space.

The Second Expert is an Industrial Person

The relational direct graph is given by the second expert opinion.

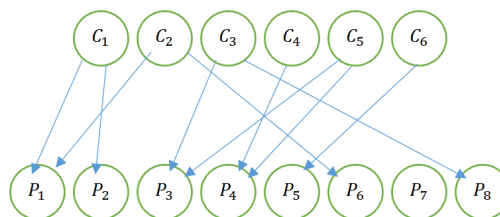


Figure 2

The relational connection matrix E_2 got from the above directed graph is as follows:

$$E_2 = \begin{bmatrix} 1 & 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 \end{bmatrix}$$

In this case the expert studies the on-state of the node ‘gain knowledge’ alone in the on-state and all other nodes in the off-state, from the range space; that is $X_1 = (1 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0)$.

The effect of X_1 on the dynamical system is.

$$X_1 E_2 = (110000) \in D$$

$$X_1 E_2^T = (11000100) = X_2 \in R$$

$$X_2 E_2 = (110000) \in D$$

$$X_2 E_2^T = (11000100) = X_3 = X_2 \in R$$

Thus the hidden pattern of the state vector X_1 is a fixed pair given by $\{(1\ 1\ 0\ 0\ 0\ 1\ 0\ 0), (1\ 1\ 0\ 0\ 0\ 0\ 0)\}$.

By keeping the node 'gain knowledge' in the on state, the expert find that the public gain the knowledge for National and International news and Educational Programmes. Evidently, C_1 and C_2 on state in the domain space.

The Third Expert is a Student

The opinion of third expert on the relational directed graph is given below

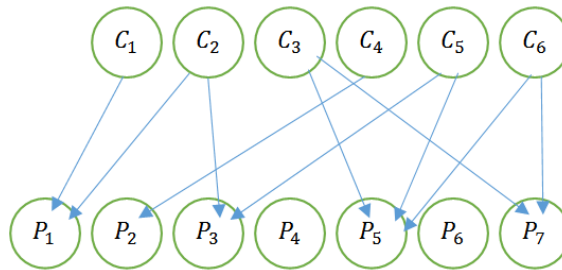


Figure 3

Fuzzy relational matrix of the third expert opinion

$$E_3 = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ 1 & 0 & 1 & 0 & 0 & 1 & 0 \\ 0 & 0 & 1 & 0 & 0 & 0 & 1 \\ 0 & 1 & 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 & 1 \\ 0 & 0 & 0 & 0 & 1 & 0 & 1 \end{bmatrix}$$

Now the expert want to study the on-state of the node $Z_1 = (001000)$ that is 'Entertaining Programmes' and all other nodes are in the off-state.

The effect of Z_1 on the dynamical-system is.

$$Z_1 E_3^T = (0\ 0\ 100010) = Z_2 \in R$$

$$Z_2 E_3 = (011011) \in D$$

$$Z_2 E_3^T = (1\ 0\ 101010) = Z_3 \in R$$

$$Z_3 E_3 = (111011) \in D$$

$$Z_3 E_3^T = (1\ 0\ 101010) = Z_4 = Z_3 \in R$$

$$Z_4 E_3 = (111011) \in D$$

Thus the hidden pattern of the state vector Z_1 is a fixed pair given by $\{(1\ 0\ 1\ 0\ 1\ 0\ 1\ 0), (1\ 1\ 1\ 0\ 1\ 1)\}$.

By keeping the node 'Entertaining Programmes' in the on-state. We find the results are the public gained

knowledge, addicted to programme, involved in wasting time and also influenced by imprudent information. Evidently, from the on-state of the nodes, P_1, P_3, P_5 and P_7 in the range space.

The Fourth Expert is a Parent

The relational directed graph given by the fourth expert's opinion is as follows.

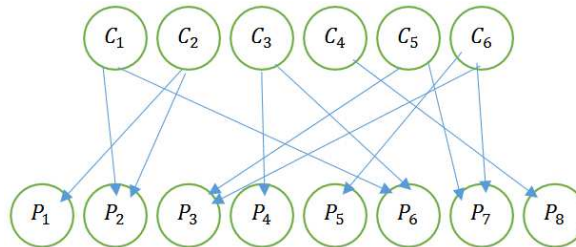


Figure 4

The relational connection matrix E_4

$$E_4 = \begin{bmatrix} 0 & 1 & 0 & 0 & 0 & 1 & 0 & 0 \\ 1 & 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 & 1 & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 1 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 1 & 0 & 1 & 0 & 1 & 0 \end{bmatrix}$$

Now we make the T_1 state is on-state (Students studies gets affected) and all other attributes of range spaces are to be in off-state.

The effected of T_1 on the dynamical system is.

$$T_1 = (00010000)$$

$$T_1 E_4^T = (0 \ 0 \ 1 \ 0 \ 0 \ 0) = T_2 \in D$$

$$T_2 E_4 = (0 \ 0 \ 0 \ 1 \ 0 \ 0 \ 1 \ 0) \in R$$

$$T_2 E_4^T = (0 \ 0 \ 1 \ 0 \ 1 \ 1) = T_3 \in D$$

$$T_3 E_4 = (0 \ 0 \ 1 \ 1 \ 1 \ 0 \ 1 \ 0) \in R$$

$$T_3 E_4^T = (0 \ 0 \ 1 \ 0 \ 1 \ 1) = T_4 (= T_3) \in D$$

$$T_4 E_4 = (0 \ 0 \ 1 \ 1 \ 1 \ 0 \ 1 \ 0) \in R$$

Thus the hidden pattern of the state vector X_1 is a fixed pair given by $\{(0 \ 0 \ 1 \ 1 \ 1 \ 0 \ 1 \ 0), (0 \ 0 \ 1 \ 0 \ 1 \ 1)\}$.

By keeping the node 'The people are addicted to programme' in the on-state, we find that the people are addicted to the entertaining programme, kids programme and jothidam, evident from the on-state of the nodes, C_3, C_5 and C_6 in the domain space.

The Fifth Expert is a Retired Person

The relational directed graph given by the fifth expert opinion

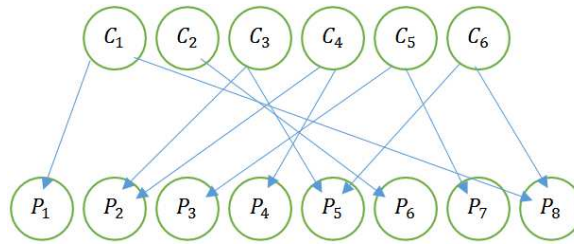


Figure 5

Fuzzy relational matrix of the fifth expert opinion

$$E_5 = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 1 & 0 & 0 & 1 & 0 & 0 \\ 0 & 1 & 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 & 1 \end{bmatrix}$$

Suppose the expert studies the on-state of the node 'Sports program' alone in the on-state and all other nodes in the off-state, that is $U_1 = (0 \ 0 \ 0 \ 1 \ 0 \ 0)$.

The effected of U_1 on the dynamical system is.

$$U_1 E_5^T = (0 \ 1 \ 0 \ 1 \ 0 \ 0 \ 0 \ 0) = U_2 \in R$$

$$U_2 E_5 = (0 \ 0 \ 1 \ 1 \ 0 \ 0) \in D$$

$$U_2 E_5^T = (0 \ 1 \ 0 \ 1 \ 1 \ 0 \ 0 \ 0) = U_3 \in R$$

$$U_3 E_5 = (0 \ 0 \ 1 \ 1 \ 0 \ 1) \in D$$

$$U_3 E_5^T = (0 \ 1 \ 0 \ 1 \ 1 \ 0 \ 0 \ 1) = U_4 \in R$$

$$U_4 E_5 = (1 \ 0 \ 1 \ 1 \ 0 \ 1) \in D$$

$$U_4 E_5^T = (0 \ 1 \ 0 \ 1 \ 1 \ 0 \ 0 \ 1) = U_4 (= U_5) \in R$$

Thus the hidden pattern of the U_1 is a fixed pair given by $\{(1 \ 1 \ 0 \ 1 \ 1 \ 0 \ 0 \ 1), (1 \ 0 \ 1 \ 1 \ 0 \ 0 \ 1)\}$.

The node 'sports programme' in the on-state, gives the resultant vector is the people gained knowledge, relax, students studies affected, waste of time and increase in crime rate, evident from the on-state of the nodes P_1, P_2, P_4, P_5 and P_8 in the range space.

Next we use all the five experts' opinion to get the New Average Fuzzy relational Maps model.

The average of these relational connection matrices E_1, E_2, \dots, E_5 of the FRM is given as E'

Where

$$E' = \frac{E_1 + E_2 + E_3 + E_4 + E_5}{5}$$

$$E' = \frac{1}{5} \begin{bmatrix} 4 & 2 & 0 & 0 & 2 & 0 & 1 \\ 3 & 0 & 1 & 0 & 0 & 2 & 0 \\ 0 & 2 & 2 & 1 & 2 & 0 & 2 \\ 0 & 4 & 0 & 3 & 0 & 0 & 0 \\ 0 & 0 & 4 & 2 & 1 & 0 & 3 \\ 0 & 0 & 1 & 0 & 4 & 0 & 3 \end{bmatrix}$$

$$E' = \begin{bmatrix} 0.8 & 0.4 & 0 & 0 & 0 & 0.4 & 0 & 0.2 \\ 0.6 & 0 & 0.2 & 0 & 0 & 0.4 & 0 & 0 \\ 0 & 0.4 & 0.4 & 0.2 & 0.4 & 0 & 0.4 & 0.2 \\ 0 & 0.8 & 0 & 0.6 & 0 & 0 & 0 & 0.2 \\ 0 & 0 & 0.8 & 0.4 & 0.2 & 0 & 0.6 & 0 \\ 0 & 0 & 0.2 & 0 & 0.8 & 0 & 0.6 & 0.2 \end{bmatrix}$$

Now using the parameter $\alpha = 0.5 \in [0,1]$ we write E' as follows. Let E' be the threshold using $\alpha = 0.5$. All elements E' which are greater than or equal to ± 0.5 be replaced by ± 1 respectively and other terms by 0.

$$E = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 & 1 & 0 \end{bmatrix}$$

Now the on-state of the vector $y_1 = (0 \ 1 \ 0 \ 0 \ 0 \ 0)$, that is the note 'Educational programme' alone in the on-state and all other nodes in the off-state.

The effected of Y_1 on the dynamical system is.

$$Y_1 E^T = (1 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0) = Y_2 \in R$$

$$Y_2 E = (1 \ 1 \ 0 \ 0 \ 0 \ 0) \in D$$

$$Y_2 E^T = (1 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0) = Y_3 \in R$$

$$Y_3 E = (1 \ 1 \ 0 \ 0 \ 0 \ 0) \in D$$

$$Y_3 E^T = (1 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0) = Y_4 = Y_3 \in R$$

Thus the hidden pattern of the state vector Y_1 is a fixed pair given by $\{(1 \ 1 \ 0 \ 0 \ 0 \ 0), (1 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0)\}$.

By keeping the node 'Educational Programme' in the on state, find that the public get the knowledge. It's evident that the on state of the nodes P_1 in the range space.

Suppose the expert studies the on state of the node 'Imprudent information' alone in the on state and all other nodes in the off state, that is $(0 \ 0 \ 0 \ 0 \ 0 \ 1 \ 0)$.

The effected of W_1 on the dynamical system is.

$$W_1 E^T = (0 \ 0 \ 0 \ 0 \ 1 \ 1) = W_2 \in D$$

$$W_2 E = (0 \ 0 \ 1 \ 0 \ 1 \ 0 \ 1 \ 0) \in R$$

$$W_2 E^T = (0 \ 0 \ 0 \ 0 \ 1 \ 1) = W_3 = W_2 \in D$$

$$W_3 E = (0 \ 0 \ 1 \ 0 \ 1 \ 0 \ 1 \ 0) \in R$$

Thus the hidden pattern of the state vector W_1 is a fixed pair given by $\{(0\ 0\ 0\ 0\ 1\ 1), (0\ 0\ 1\ 0\ 1\ 0\ 1\ 0)\}$.

By keeping the node, 'Imprudent information' in the on-state, we find that the children are affected by the kids programme. Evident that the on-state of the nodes C_5 and C_6 in the domain space.

COMPARISON OF THE EXPERTS OPINION – ANALYSIS OF THE FRM MODELS FOR CONCLUSIONS

It is an innovative method to use tables to find out the closeness or deviation of experts for a given initial state vector from the domain or range space. In this section we give the table of comparison which acts as a ready reckoner for comparison of one expert with the other and also of each and every expert with the new NAFRMs constructed using the all experts' opinion.

The Table 1 gives the comparison of the five experts and the resultant vectors given by the New Average Fuzzy Relational Maps in the columns E_1, E_2, E_3, E_4, E_5 and E respectively.

Table 1: Comparison Table of FRMs of the Five Experts and the NAFRMs

State Vector	E_1	E_2	E_3
(100000)	{{(10000100)(110000)}}	{{(11000100)(110000)}}	{{(10101010)(111011)}}
(010000)	{{(10000100)(110000)}}	{{(11000100)(110000)}}	{{(10101010)(111011)}}
(001000)	{{(01011010)(001111)}}	{{(00110001)(001110)}}	{{(10101010)(111011)}}
(000100)	{{(01011010)(001111)}}	{{(11110101)(111110)}}	{{(01000000)(000100)}}
(000010)	{{(01011010)(001111)}}	{{(00110001)(001110)}}	{{(10101010)(111011)}}
(000001)	{{(01011010)(001111)}}	{{(00110001)(001110)}}	{{(10101010)(111011)}}
(10000000)	{{(11010110)(111111)}}	{{(11000100)(110000)}}	{{(10101010)(111011)}}
(01000000)	{{(01011010)(001111)}}	{{(11000100)(110000)}}	{{(01000000)(000100)}}
(00100000)	{{(00100000)(000000)}}	{{(00110001)(001110)}}	{{(10101010)(111011)}}
(00010000)	{{(01011010)(001111)}}	{{(00110001)(001110)}}	{{(00000000)(000000)}}
(00001000)	{{(01011010)(001111)}}	{{(00001000)(000001)}}	{{(10101010)(111011)}}
(00000100)	{{(10000100)(110000)}}	{{(11000100)(110000)}}	{{(00000000)(000000)}}
(00000010)	{{(01011010)(001111)}}	{{(00000000)(000000)}}	{{(10101010)(111011)}}
(00000001)	{{(01011011)(001111)}}	{{(00110001)(001110)}}	{{(00000000)(000000)}}

State Vector	E_4	E_5	E
(100000)	{{(11000101)(110100)}}	{{(11011001)(101101)}}	{{(10000000)(110000)}}
(010000)	{{(11000101)(110100)}}	{{(00000100)(010000)}}	{{(10000000)(110000)}}
(001000)	{{(00111010)(001011)}}	{{(11011001)(101101)}}	{{(00000000)(001000)}}
(000100)	{{(11000101)(110100)}}	{{(11011001)(101101)}}	{{(01010000)(000100)}}
(000010)	{{(00111010)(001011)}}	{{(00100010)(000010)}}	{{(00101010)(000011)}}
(000001)	{{(00111010)(001011)}}	{{(11011001)(101101)}}	{{(00101010)(000011)}}
(10000000)	{{(11110111)(111111)}}	{{(11011101)(111101)}}	{{(10000000)(110000)}}
(01000000)	{{(11000101)(110100)}}	{{(11011001)(101101)}}	{{(01010000)(000100)}}
(00100000)	{{(00111010)(001011)}}	{{(00100010)(000010)}}	{{(00101010)(000011)}}
(00010000)	{{(00111010)(001011)}}	{{(11011001)(101101)}}	{{(01010000)(000100)}}
(00001000)	{{(00111010)(001011)}}	{{(11011001)(101101)}}	{{(00101010)(000011)}}
(00000100)	{{(11101111)(110111)}}	{{(00000100)(010000)}}	{{(00000100)(000000)}}
(00000010)	{{(00111010)(001011)}}	{{(00100010)(000010)}}	{{(00101010)(000011)}}
(00000001)	{{(11000101)(110100)}}	{{(11011001)(101101)}}	{{(00000001)(000000)}}

For the average of the five resultant vector using the thresholding function α . This average hidden pattern is thresholded using the parameter $\alpha = 0.5 \in [0,1]$, if entries are greater than or equal to α then it is replaced by 1 if $\alpha < 0.5$ it is replaced by 0. So the average Hidden pattern is given below

Table 2: Comparison Table of NAFRMs and Average of the Hidden Pattern Pairs

Initial state vector	Average of the Hidden Pattern E'	Average of the Hidden Pattern E
(100000)	{{(11000100)(111000)}}	{{(1000000)(110000)}}
(010000)	{{(10000100)(110000)}}	{{(10000000)(110000)}}
(001000)	{{(00111010)(001111)}}	{{(00000000)(001000)}}
(000100)	{{(11010001)(101100)}}	{{(01010000)(000100)}}
(000010)	{{(00111010)(001011)}}	{{(00101010)(000011)}}
(000001)	{{(100111010)(001111)}}	{{(00101010)(000011)}}
(10000000)	{{(11010110)(111111)}}	{{(10000000)(110000)}}
(01000000)	{{(11000000)(100100)}}	{{(01010000)(000100)}}
(00100000)	{{(00100010)(001010)}}	{{(00101010)(000011)}}
(00010000)	{{(00011000)(001111)}}	{{(01010000)(000100)}}
(00001000)	{{(00011010)(001011)}}	{{(00101010)(000011)}}
(00000100)	{{(10000100)(110000)}}	{{(00000100)(000000)}}
(00000010)	{{(00101010)(001011)}}	{{(00101010)(000011)}}
(00000001)	{{(01010001)(001100)}}	{{(00000001)(000000)}}

CONCLUSIONS

The positive and negative influence of Communication Industry is represented in a resultant vector in this paper using the FRMs model. It can be concluded that the Hidden patterns, suggested by the experts and the NAFRMs, are actually fixed points. Therefore it is evident that these attributes are stable. It is both, time saving as well as economical.

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